

Remarks

I. Summary of Final Office Action

Claims 1-67 are pending in this case. Claims 1, 9, 11, 20, 27, 29, 66 and 67 are independent claims.

Claims 1, 2, 7, 8, 9-12, 14, 19-21, 26-31, 36-41, 43-45 and 54-65 were finally rejected under 35 U.S.C. § 102(e) as being anticipated by Heath, Jr. et al. U.S. Patent No. 6,298,092 ("Heath").

Claims 3-6, 13, 15-18, 22-25, 30, 32-35 and 46-53 were rejected as being dependent upon a rejected base claim, but were indicated as allowable if rewritten in independent form to include all the limitations of the base claim and any intervening claims.

Claims 66 and 67 were allowed.

II. Summary of Examiner Interview

Applicants and applicants' undersigned attorney and agent, Richard Lehrer and Peter Snell, wish to thank the examiner for the courtesies extended during the telephonic interview of May 25, 2005. During the interview, the Section 102 rejection based on Heath was discussed. Particularly, applicants restated the argument previously set forth in applicants' December 20, 2004 Reply to Office Action that the pending claims are allowable over Heath. The Examiner agreed (i) to reconsider the Section 102 rejection upon receipt of this Reply to Final Office Action from applicants and (ii) that if Heath fails to disclose the ability for a set of antennas to be simultaneously employed for both time diversity and spatial multiplexing then Heath does not anticipate the claims of the present invention. The Examiner also agreed to mail the Advisory Action to applicants

as soon as possible. The remarks below formed, for the most part, the basis of the interview.

III. 35 U.S.C. § 102 Rejection

Independent Claims 1, 9, 11, 20, 27 and 29 are directed to methods and apparatus for use with a system that transmits OFDM signals from a plurality of transmitter antennas to a plurality of receiver antennas, where at least one of the OFDM signals includes a plurality of sub-carriers. Claims 1 and 11 include, *inter alia*, a receiver/controllers configured to make a determination “for a sub-carrier of the plurality of sub-carriers as to whether time diversity or spatial diversity should be used for subsequent transmission on the sub-carrier.” Similarly, Claim 9 includes a controller arranged to respond to a feedback signal, “the feedback signal indicative of a determination for a sub-carrier of the plurality of sub-carriers as to whether time diversity or spatial diversity should be used for subsequent transmission on the sub-carrier,” to assign constellation points for the time diversity or the spatial diversity to the sub-carrier. Claims 20, 27 and 29 include features similar to the above-described features of Claims 1, 9 and 11. Because the claimed invention operates on the sub-carrier level, the same set of antennas may be simultaneously employed for both time diversity and spatial multiplexing.

In the Office Action, the Examiner contends that Heath shows all the features of applicants’ independent claims. Applicants respectfully disagree. In particular, Heath does not disclose or suggest, *inter alia*, applicants’ claimed approaches of making a determination, or responding to a feedback signal indicative of a determination, “for a **sub-carrier** of . . . [a] plurality of sub-carriers as to whether time diversity or spatial

diversity should be used for a subsequent transmission on the sub-carrier” (emphasis added).

Rather, Heath determines whether given **antennas** 72 (FIG. 3) will use diversity or spatial multiplexing:

[An] assignment of transmit signals TS_p to k of transmit **antennas** 72 can be made [for diversity coding].

...
Spatial multiplexing . . . can involve a prescribed or random assignment of transmit signals TS_p to k of transmit **antennas** 72.

...
When $k < M$ then $M-k$ transmit **antennas** 72 are used for diversity.

Heath, col. 9, l. 54 to col. 10, ll. 17; emphasis added.

The Examiner contends that the portion of Heath at column 4, lines 48-51 shows making determinations for sub-carriers (see pp. 4, 5, 7, 8, and 11 of the Office Action). However, contrary to the Examiner’s contention, this portion merely reinforces that Heath makes its determinations at the antenna level, and not the sub-carrier level.

The proposed mapping schemes in this embodiment can include random or determined assignment of transmit signals TS_p to k of the M transmit **antennas** as discussed above in case of diversity coding and spatial multiplexing.

Heath, col. 4, ll. 48-51; emphasis added.

The difference between applicants’ claimed approach and Heath can be understood with reference to, for example, applicants’ FIG. 4. As shown, transmitter antennas “Antenna_1” and “Antenna_2” transmit OFDM symbols that include a plurality of sub-carriers. In accordance with applicants’ claimed approach, a determination may be made that a given sub-carrier k (S_k) should use spatial diversity for the transmission. This causes the antennas in FIG. 4 to use spatial diversity for the sub-carrier k (i.e., Antenna_1 transmits signals $S_k(1)$ and $S_k(2)$ on sub-carrier k that are independent of

signals $S_k(3)$ and $S_k(4)$ transmitted by Antenna_2 on sub-carrier k) (see also p. 3, ll. 13-15 and p. 11, ll. 18-20 of applicants' specification). However, the same antennas may still be employed using, for example, either spatial diversity or time diversity for the other sub-carriers. In direct contrast, Heath does not make any determinations for particular sub-carriers. Instead, Heath determines whether given antennas should use time diversity or spatial multiplexing. Thus, assuming *arguendo* that the Heath approach could be applied to applicants' FIG. 4, a Heath determination that the FIG. 4 antennas should use spatial diversity would cause all of the sub-carriers transmitted by the antennas to use spatial diversity.

This difference between applicants' claimed approach and Heath is further described with respect to the following diagram, which is presented for the purposes of illustration and not limitation. As shown, when Heath makes a determination that a given **antenna** will use time diversity (T), all of the sub-carriers (i.e., sub-carriers 1 to n) transmitted by that antenna must use time diversity. In stark contrast, when the claimed invention makes a determination that a **sub-carrier** (e.g., sub-carrier 1) will use time diversity, other sub-carriers transmitted by the antenna may still use, for example, either time diversity (T) or spatial multiplexing (S). *

* The above example with respect to applicants' FIG. 4 and the diagram included in this Reply are not an admission by applicants that Heath enables the use of its approach in an OFDM system. On the contrary, applicants reserve the right to demonstrate at a later stage if necessary that Heath is not so enabling.

		Sub-carrier 1	Sub-carrier 2	Sub-carrier 3	...	Sub-carrier n
HEATH	Antenna	T	T	T	...	T
CLAIMED INVENTION	Antenna	T	(T or S)	(T or S)	...	(T or S)

Thus, the foregoing demonstrates that Heath does not disclose or suggest all the features of applicants' independent Claims 1, 9, 11, 20, 27 and 29. The independent claims and corresponding dependent claims 2, 7, 8, 10, 12, 14, 19, 21, 26, 28, 30, 31, 36-41, 43-45 and 54-65 are therefore allowable over Heath. Accordingly, the Examiner is respectfully requested to reconsider and withdraw the 35 U.S.C. § 102 rejection of Claims 1, 2, 7, 8, 9-12, 14, 19-21, 26-31, 36-41, 43-45 and 54-65.

IV. Conclusion

Applicants respectfully submit that the foregoing demonstrates that this application is in condition for allowance. Accordingly, prompt consideration and allowance of this application are respectfully requested.

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Respectfully submitted,



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